

Fig. 1

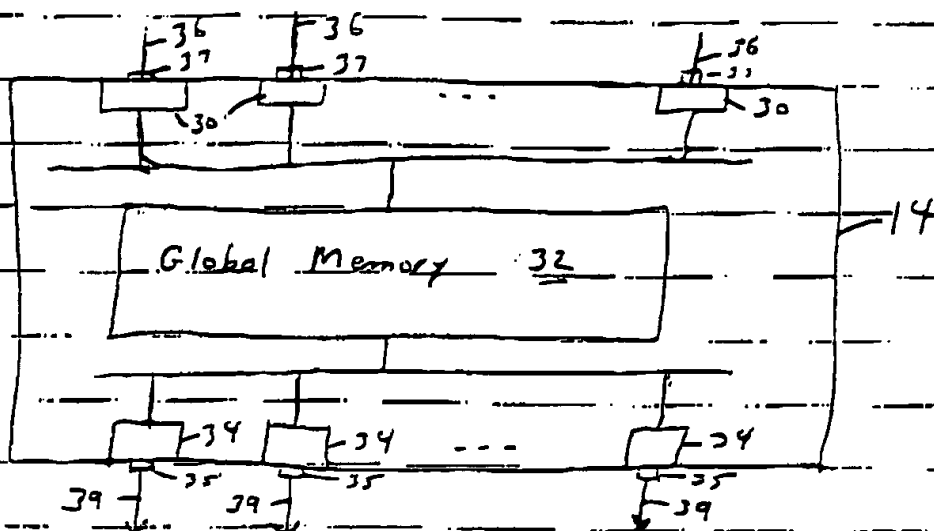


Fig. 2

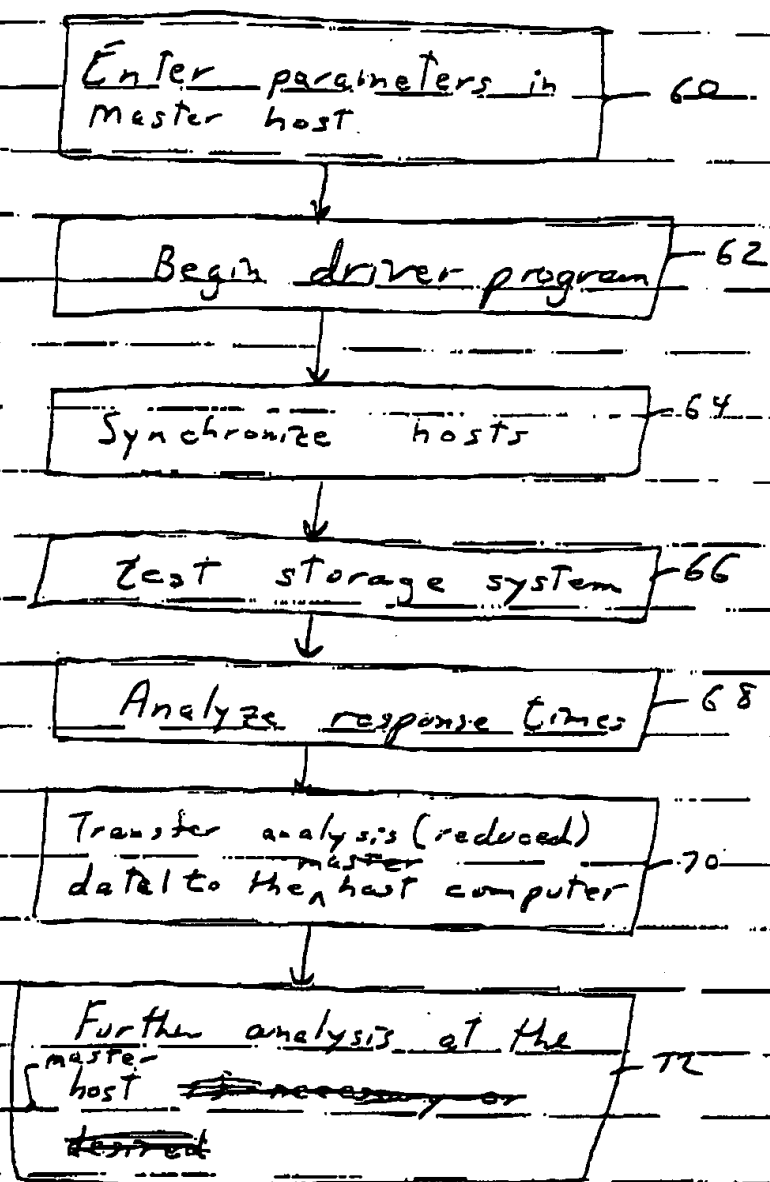


Fig. 3

OS-221-1000 "221-1000"	REQUIRED	Number of logical disks
		Number of "child" processes to start
		Number of capture response times
		Number of response times
		Buffer size
		Offset size
		Maximum range
		time of test
		read/write size
		read/write mix
		ID of devices being tested
		ID of master & client hosts
		I/O type (sequential or random)
		Number of I/O operations performed to correct offset address
		Displacement from offset
OPTIONAL	Delay between commands	
	Initial byte offset	
	Number of seeks for random I/O	
	Data reduction method	
		ICDA percent hit rate

Fig. 4

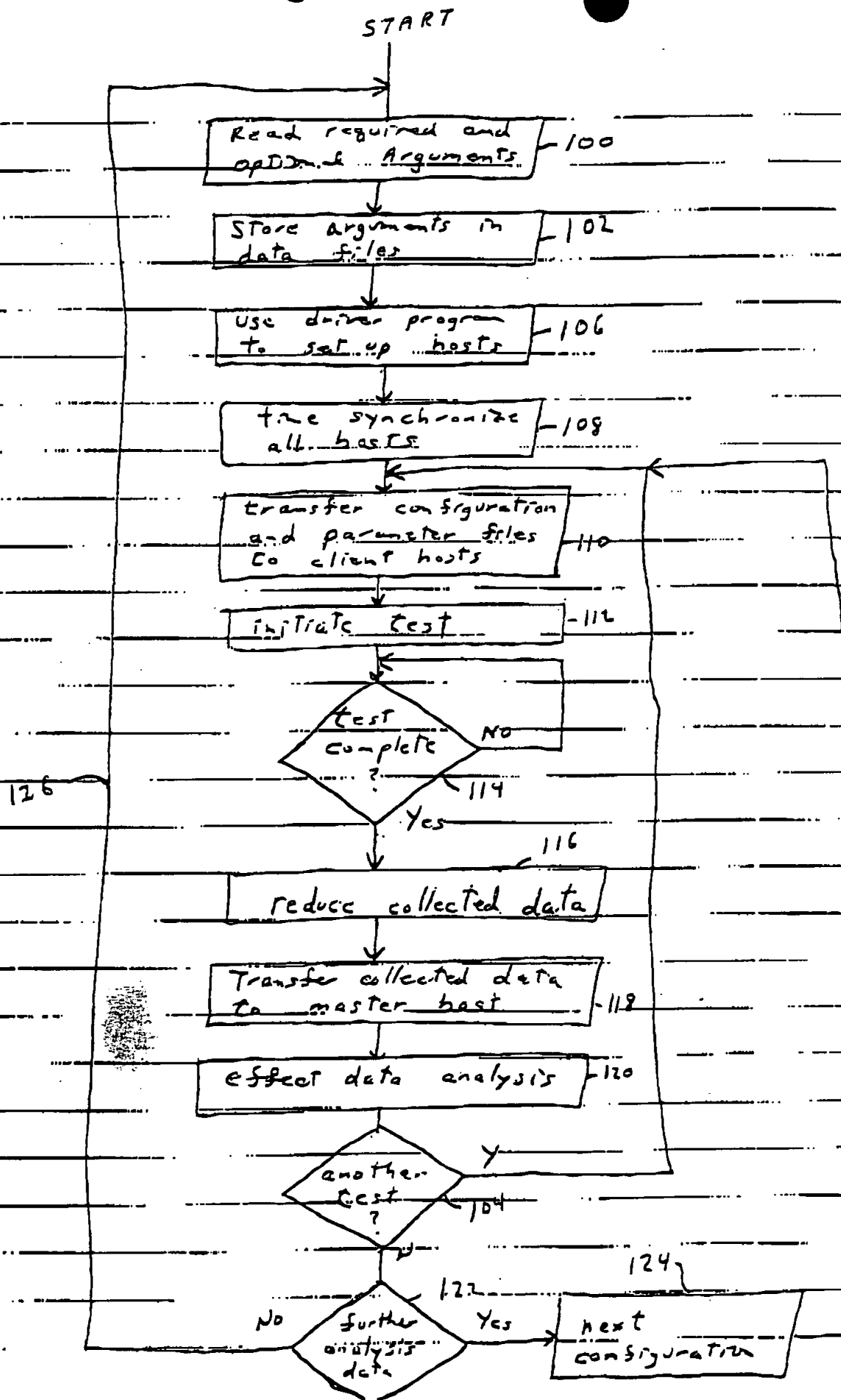


Fig 5

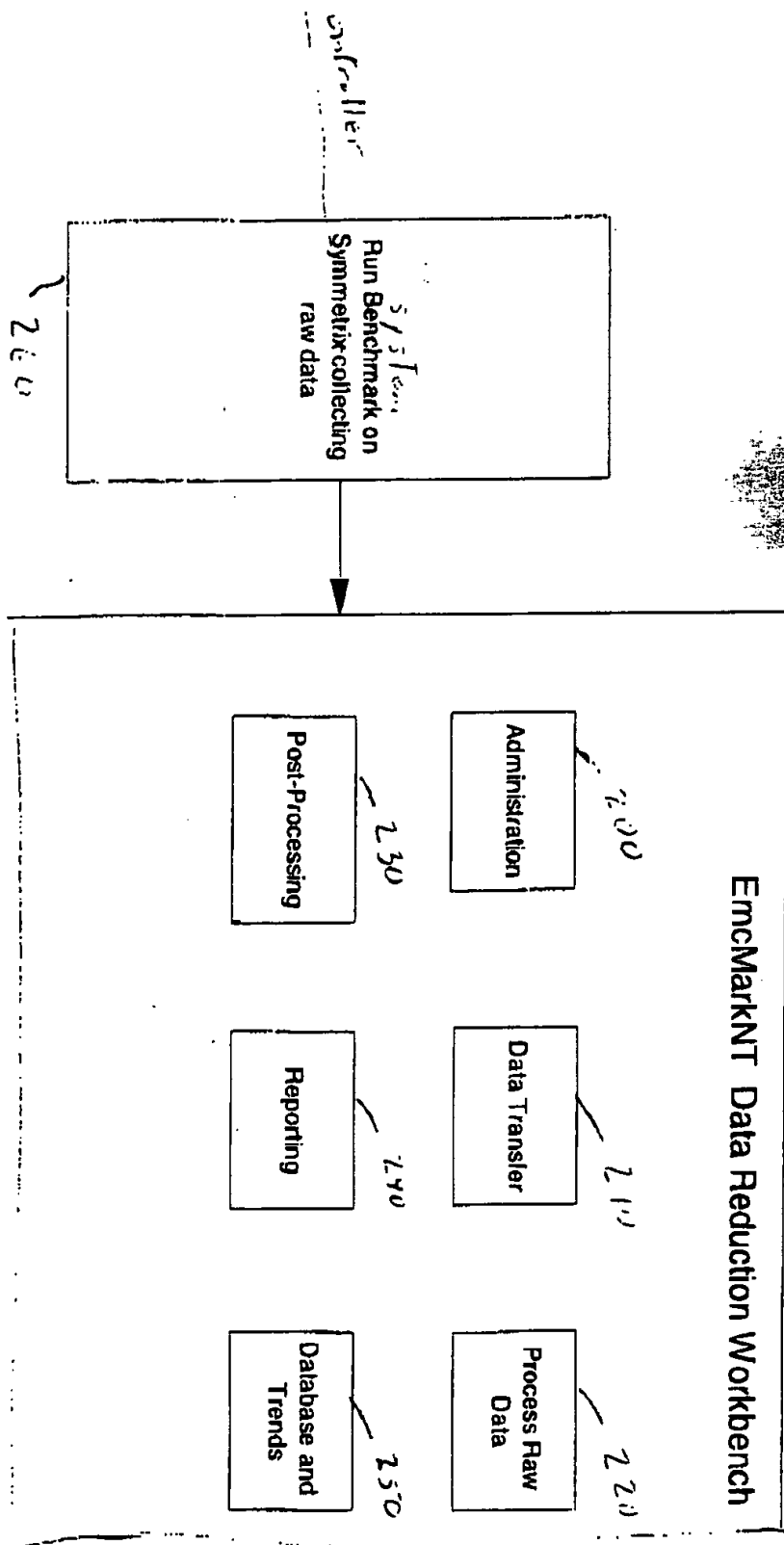


Fig. 6

09642267.081800

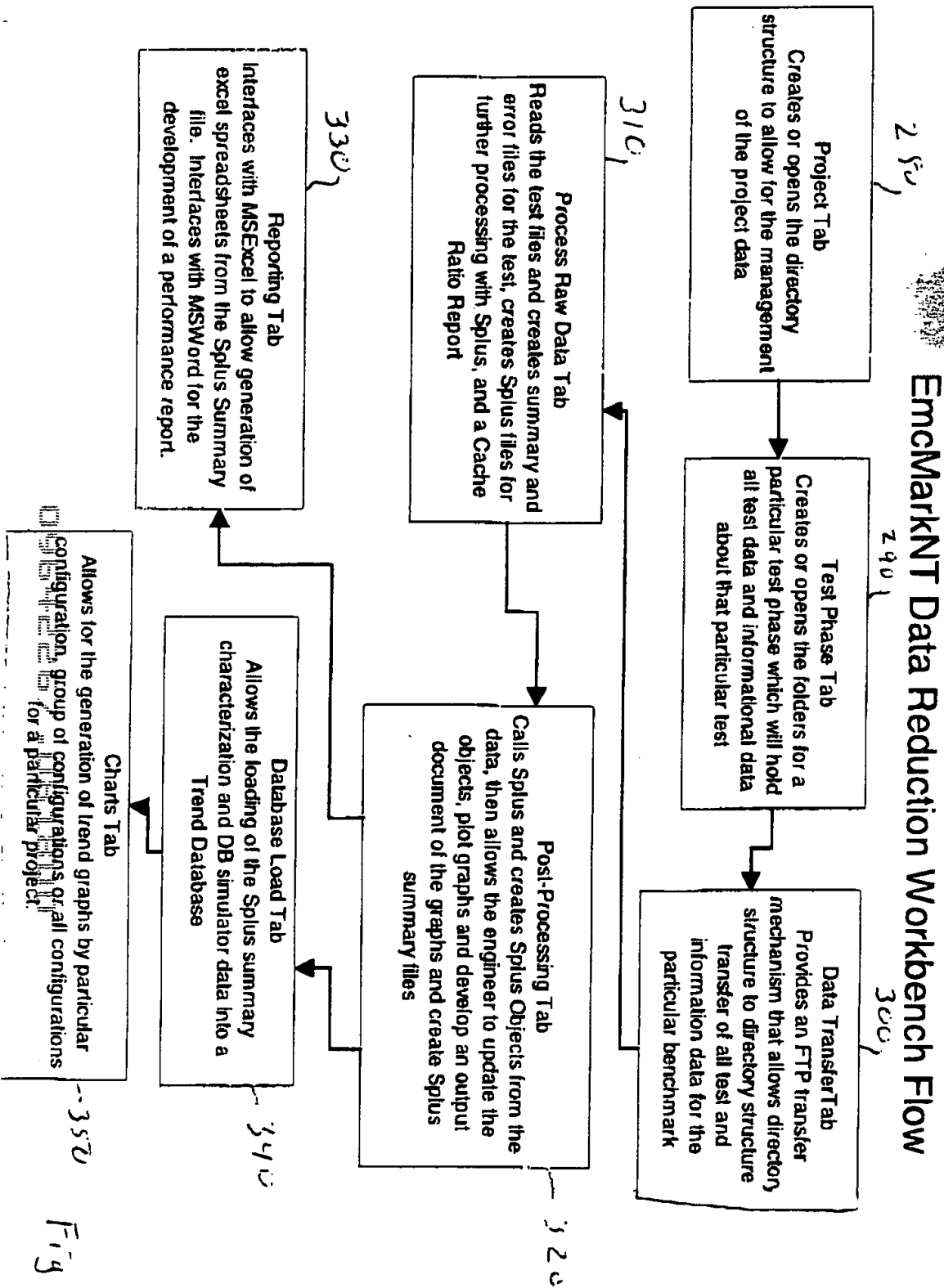
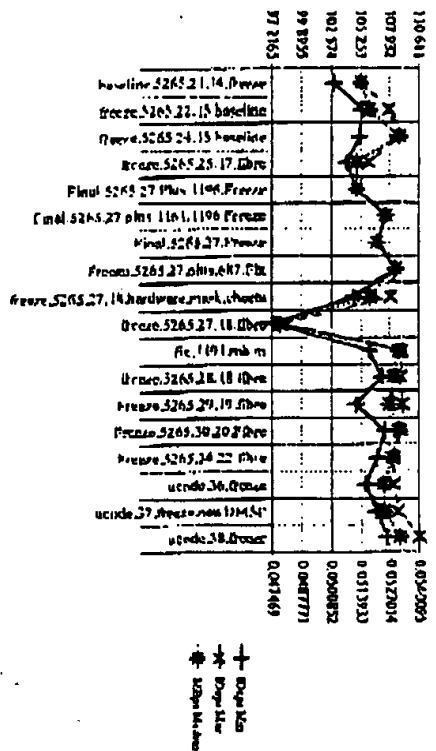
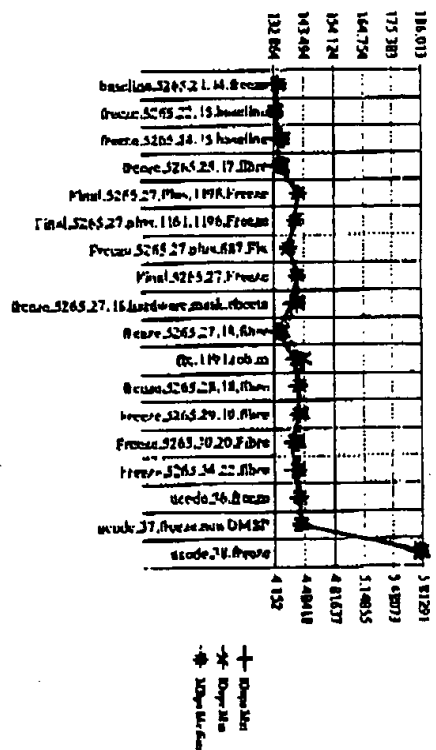


Fig. 7

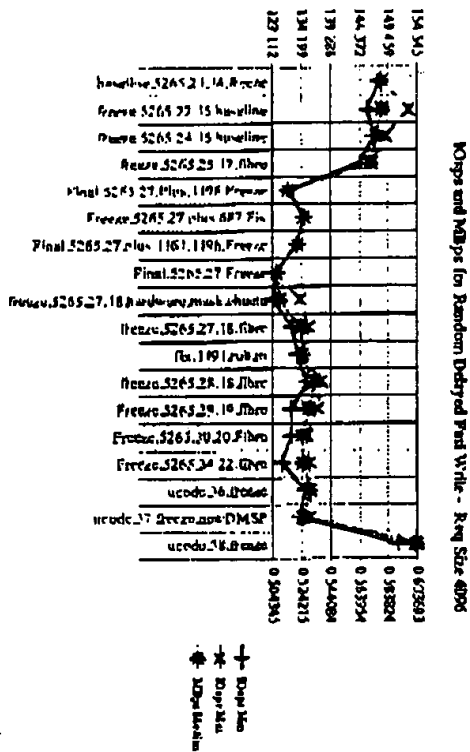
JOSSEY and MIBPM for Random Delayed Fast Write - Page Size 412



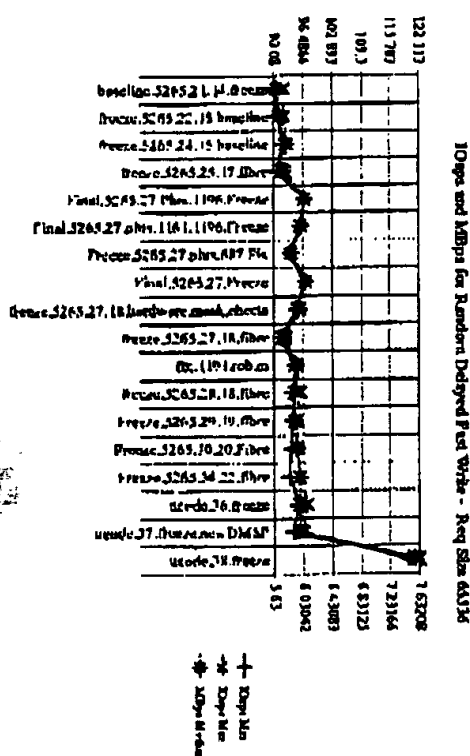
BA - 1 BAltCo - 1 BAPer - 1 DA - 1 DAP or - 1 DAPer - 1 Drive - 3 Lem. - 1 Hyper - 1



BA - 1 BAPPO - 1 BAPPI - 1 DA - 2 DAPPO - 1 DAPI - 2 DiVA - 1 Lm - 1 MPP - 1



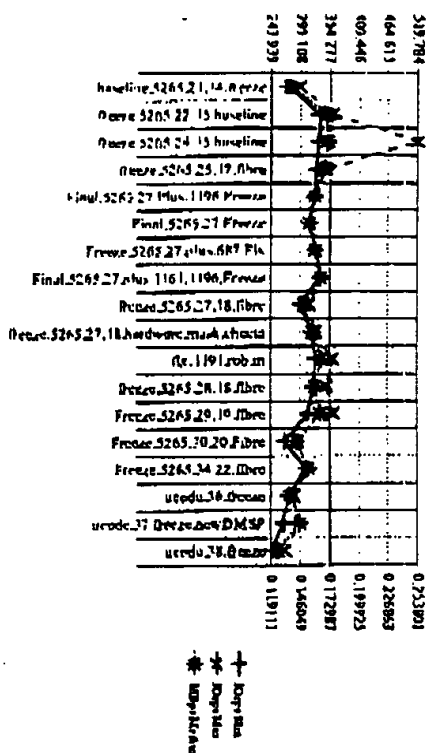
BA. 1 BALTIC. 1 BAPOL. 1 DA. 2 DASTOC. 2 DAPET. 2 DITE. 2 LAM. 1 HYPOT. 1



BA / BA7m - I BA7n - IDA / DA7m - J DA7n - K DA8 - L BA9 -

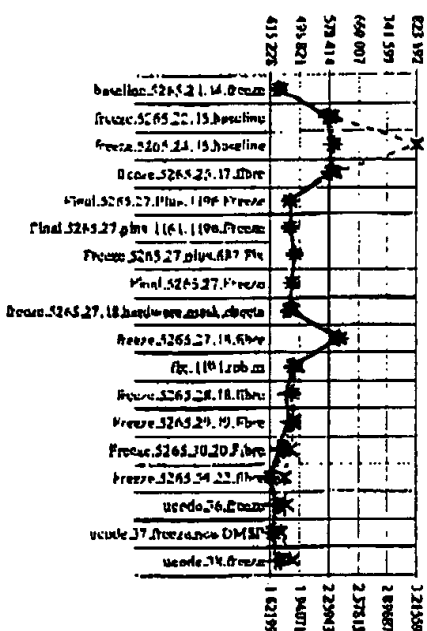
Fig 8A

10ops and MDps for Random Delayed Fast Write - Req Size 512



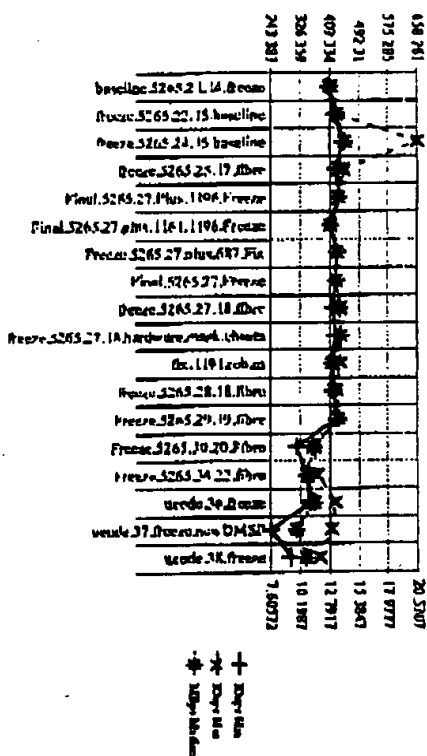
Uta - 4 UATm - 8 UATm - 8 DA - 1 DUTm - 7 DUTm - 12 Lm - 24 Iqur - 4

10bps and MBps for Random Delayed First Write - Req Size 4096



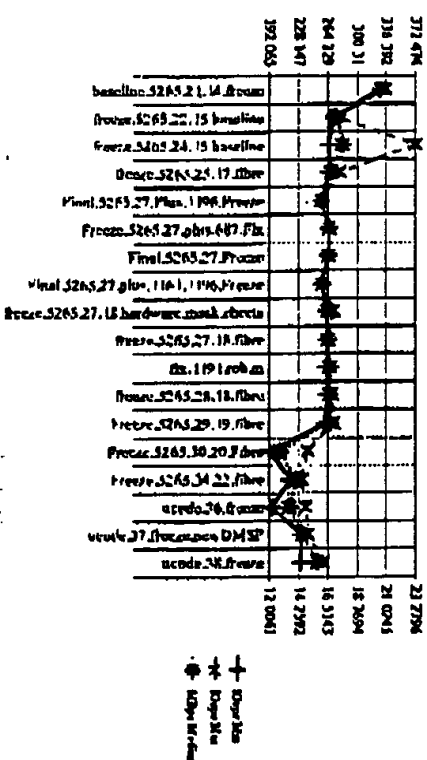
BA - 4 BAUFör - 9 BAUFer - 6 DA - 1 DAUFör - 1 DAUFer - 7 Dativ - 12 Les - 24 HJTF - 4

IOps and MBps for Random Delayed Full Write - Req Size 32768



BA-4 BAPPI - 0 BAUFI - 0 DA-7 DAIK - 1 DAVI - 1 DEVI - 12 LAM - 24 LIPI - 6

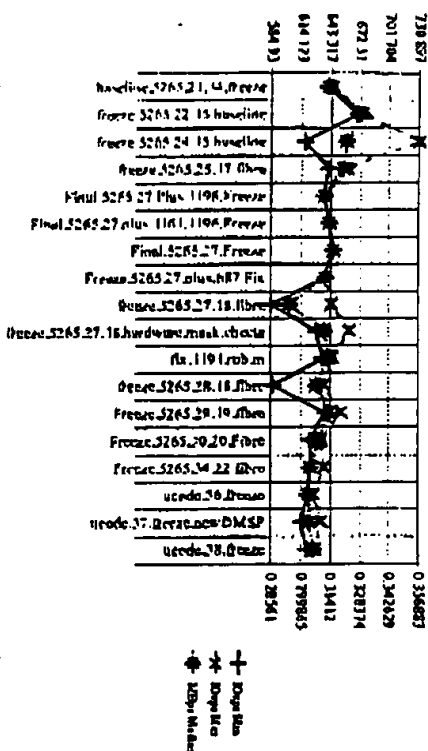
Korps und MBPs for Random Delayed Fast Write - Reg Size 65536



HA-4 HART-1 HART-6 DA-7 DAF-2 DAF-3 DAF-4 DAF-5 DAF-6 DAF-7 DAF-8 DAF-9 DAF-10 DAF-11 DAF-12 DAF-13 DAF-14 DAF-15 DAF-16 DAF-17 DAF-18 DAF-19 DAF-20 DAF-21 DAF-22 DAF-23 DAF-24 DAF-25 DAF-26 DAF-27 DAF-28 DAF-29 DAF-30 DAF-31 DAF-32 DAF-33 DAF-34 DAF-35 DAF-36 DAF-37 DAF-38 DAF-39 DAF-40 DAF-41 DAF-42 DAF-43 DAF-44 DAF-45 DAF-46 DAF-47 DAF-48 DAF-49 DAF-50 DAF-51 DAF-52 DAF-53 DAF-54 DAF-55 DAF-56 DAF-57 DAF-58 DAF-59 DAF-60 DAF-61 DAF-62 DAF-63 DAF-64 DAF-65 DAF-66 DAF-67 DAF-68 DAF-69 DAF-70 DAF-71 DAF-72 DAF-73 DAF-74 DAF-75 DAF-76 DAF-77 DAF-78 DAF-79 DAF-80 DAF-81 DAF-82 DAF-83 DAF-84 DAF-85 DAF-86 DAF-87 DAF-88 DAF-89 DAF-90 DAF-91 DAF-92 DAF-93 DAF-94 DAF-95 DAF-96 DAF-97 DAF-98 DAF-99 DAF-100

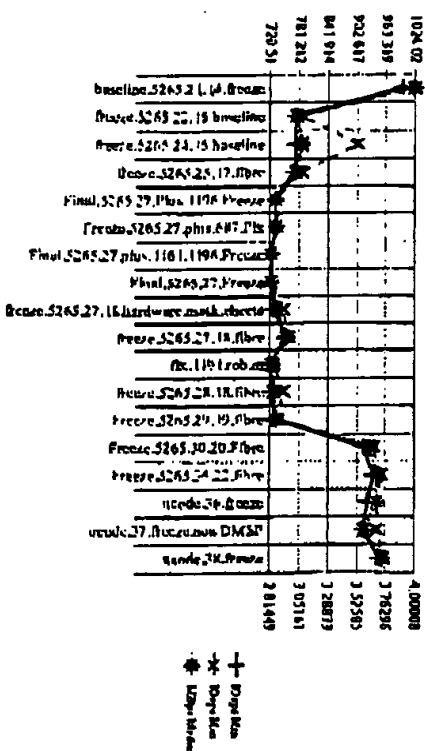
Fig 8C

IOops and MBps for Random Delayed Fast Write - Req Size 512



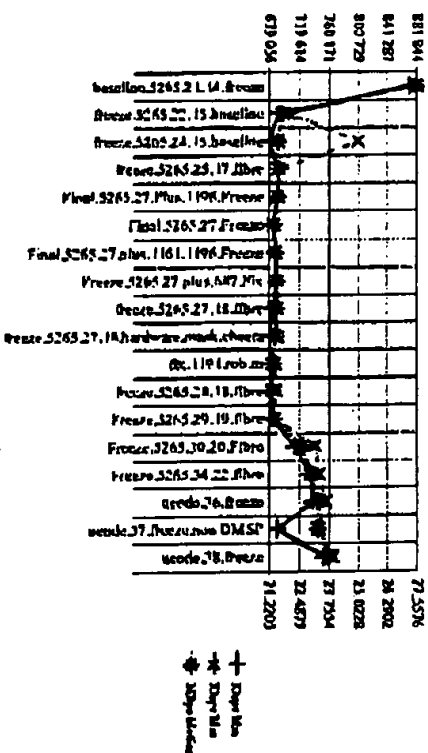
BA - 4 BAFire - 8 BAFire - 8 DA - 2 DAFire - 2 DAFire - 4 DAFire - 24 Lrm - 48 Hyper - 4

IOops and MBps for Random Delayed Fast Write - Req Size 4096



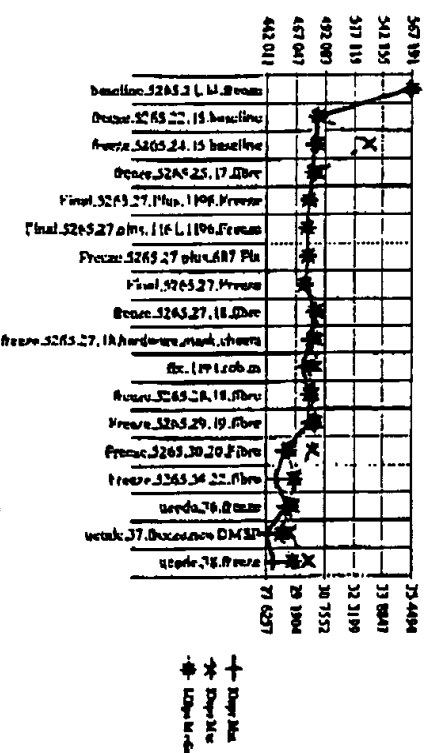
BA - 4 BAFire - 8 BAFire - 8 DA - 2 DAFire - 2 DAFire - 4 DAFire - 24 Lrm - 48 Hyper - 4

IOops and MBps for Random Delayed Fast Write - Req Size 2048



BA - 4 BAFire - 8 BAFire - 8 DA - 2 DAFire - 2 DAFire - 4 DAFire - 24 Lrm - 48 Hyper - 4

IOops and MBps for Random Delayed Fast Write - Req Size 65536



BA - 4 BAFire - 8 BAFire - 8 DA - 2 DAFire - 2 DAFire - 4 DAFire - 24 Lrm - 48 Hyper - 4

Fig 8P

Post Processing Tab

The Post Processing Tab creates objects, plot graphs and generates summary files using the Splus Data Analysis Software.

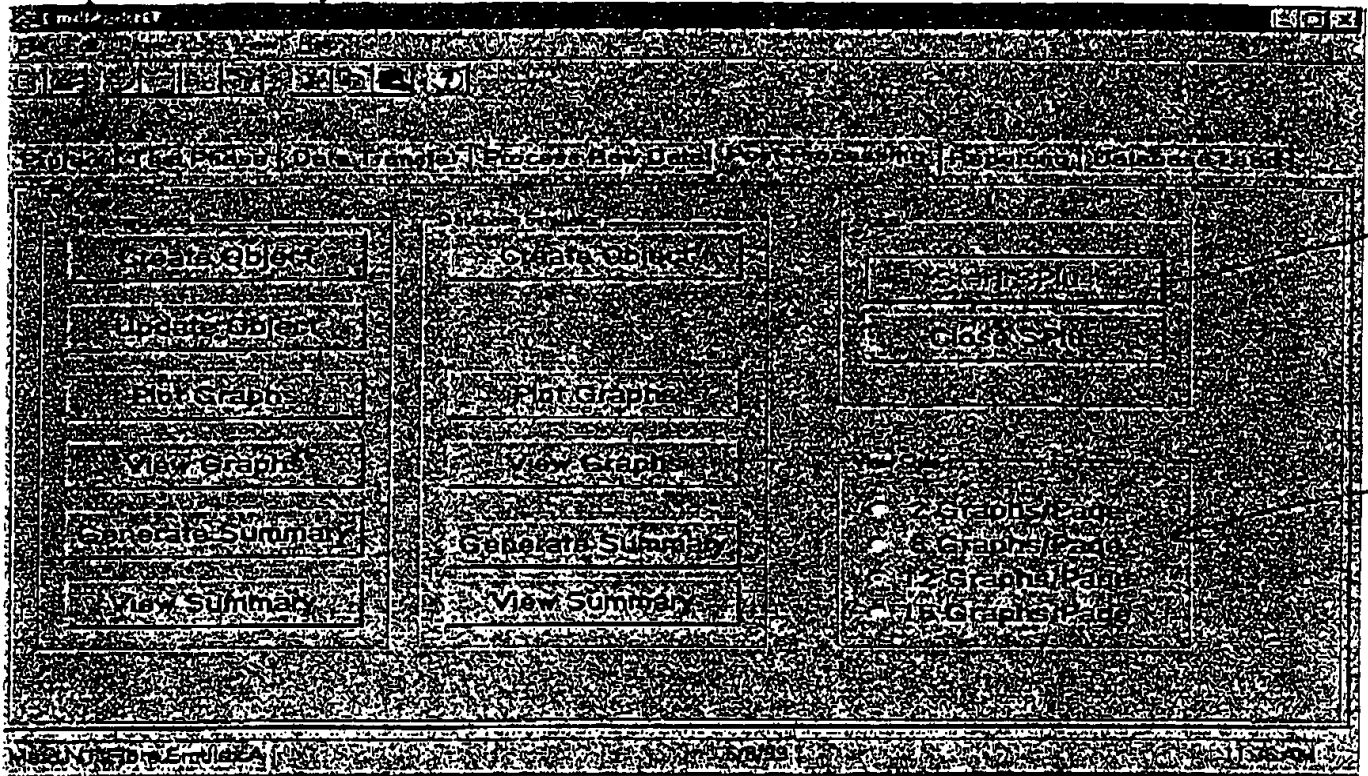
**Starting SPLus**

Fig. 4

1. Click on the Start Splus Button
(Object buttons will be grayed out until Splus is running. If graphs or summary files have already been created those buttons will be visible)
2. Bring up the Splus window to watch for errors and to use during the Update Objects routine
3. Select 2 graphs/page 8 graphs/page, 12 graphs/page or 15 graphs/page option for viewing the graphs once generated
4. Process Characterization or Database Simulator objects follow instructions on the next page.
5. Select the Close Splus button when you are leaving this tab
(If there is a problem closing Splus, bring up the window and close manually. Select NO twice to its Save Reports and Objects questions)

(If you forget to close Splus before you exit the EMCMarkNT Data Reduction Tool you will need to quit out of Splus from the command line by typing q() or by file -> exit)

6. Go to the Reporting Tab

October 13, 1999

23 of 32

EMC² Confidential

Symmetrix Configuration View

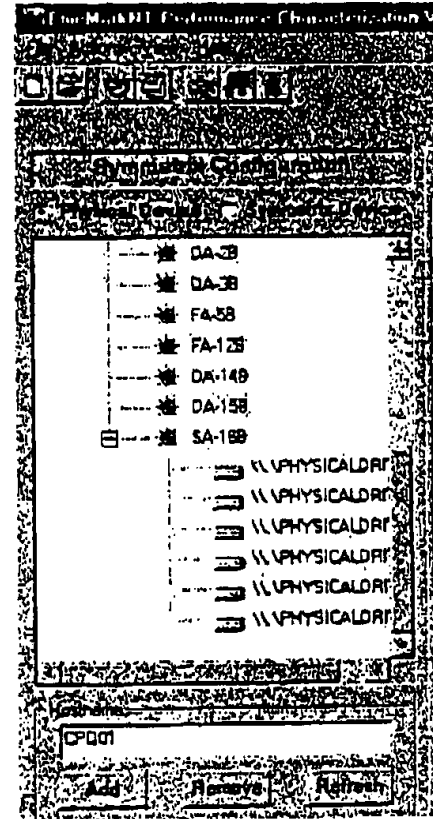
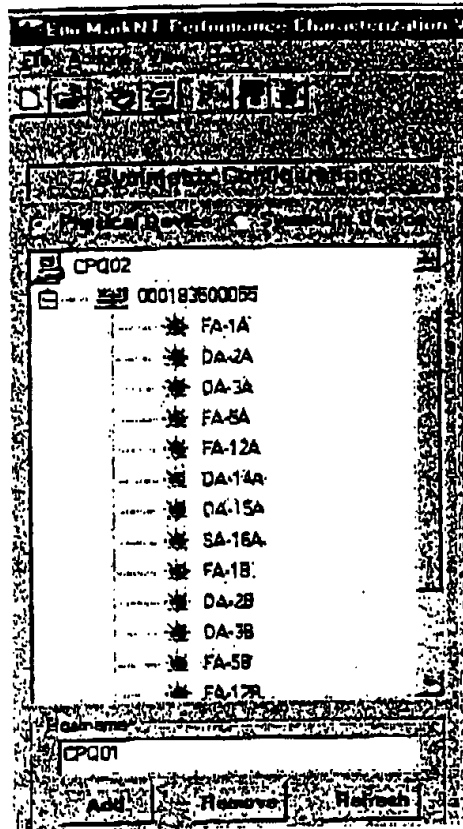
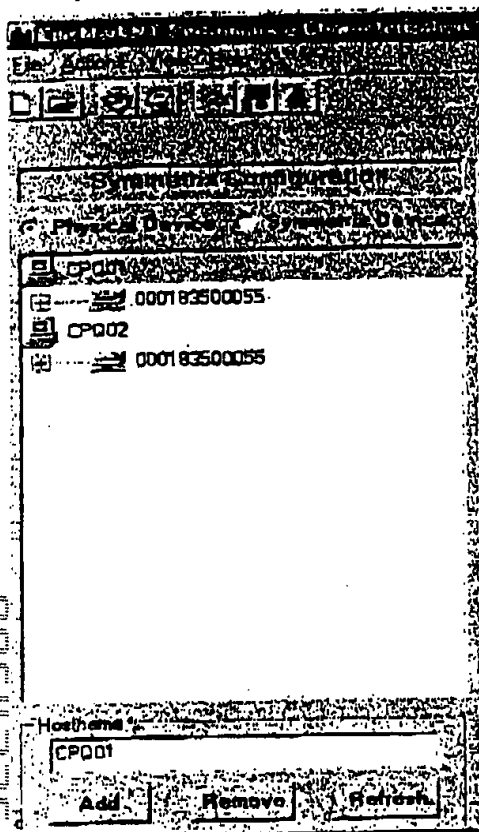


Fig. 9A

Lists the hosts and Symmetrix system
When the Symmetrix is expanded, BAs and DAs and will be displayed. Red indicates inactive and green indicates active

Physical Devices – will list the physical device names connected to the Symmetrix
Symmetrix Devices – will list the Symmetrix device names connected to the Symmetrix

Hostname – is the host highlighted on the list

The first host in the list is considered the Master Host
If no host is listed then the host you are on is considered the Master Host

Local, Remote, Gateway

If the Master Host is the host you are on then the job will run locally
If the Master Host is not the host you are then the job will run remotely, except
If there is a gateway setup in the Environment Tab, then the job will run through the gateway

Add – will add the host name typed in the Hostname box
Remove – will remove the host name typed in the Hostname box
Refresh – will refresh the host/Symmetrix information

Device Details

Device Details

Vendor:	EMC	Port:	0
Product:	SYMMETRIX	Port 1:	0
Symmetrix ID:	000183500055	Port 2:	2
Device:	SA-168		
Emul Number:	1		

Symmetrix Device:	000	Block Size:	512
Physical Device:	\\PHYSICALDRIVE0	Capacity:	7741440
Logical Device:		Cylinders:	8064
Serial Number:	55000321	Emulation:	FBA
Device Status:	Ready	Mirror Policy:	two-way mirror

<input type="checkbox"/> CDD	<input type="checkbox"/> META Head	<input type="checkbox"/> Power Path Parent	<input type="checkbox"/> RUF
<input type="checkbox"/> ASSOC	<input type="checkbox"/> META Member	<input type="checkbox"/> Power Path Child	<input type="checkbox"/> BGS
<input type="checkbox"/> VCM	<input type="checkbox"/> Gatekeeper	<input type="checkbox"/> Power Path Sibling	<input type="checkbox"/> BCP
<input type="checkbox"/> Mixed	<input type="checkbox"/> Multichannel	<input type="checkbox"/> Nonchannel	<input type="checkbox"/> META

OK

FIG. 9B

Symmetrix Details

Director Details

Director:	FA-1A	Num Ports:	1
Director Type:	Fibre Adapter	Port 0 status:	On
Director Num:	1	Port 1 status:	N/A
Slot Num:	1	Port 2 status:	N/A
SCSI Width:	N/A	Port 3 status:	N/A

OK

FIG. 9C

EncMarkNT Performance Characterization Workbench

Definition | Environment | Workload | Configuration | Benchmark | Results | Tools

Project Name: Test Phase: Test Description:

Storage Array Frame

Storage Array: Model: Serial: Cache: Cache Date:

Details Frame

Raid Type: Mirror Policy: Hyper/Parity: Cache Size: Physical Disks: Disk Type:

Host Name:

Add Remove Refresh

Project name – The project set up for this test.

- Select the New Project button to setup a new project, or the Open Project button to open a different Project.

Test Phase – the Test Phase setup for this test

- Select the New Test Phase button to setup a new test phase, or the Open Test Phase button to open a different Test phase under this project.

Test Description – comes from the ini file located in the Test Phase/Scripts folder

Storage Array Frame and Details Frame information from the ini file located in the Test Phase/Scripts folder
You can manually update the fields, or if you double click on the Symmetrix box the information gathered from the Symmetrix will be populated into those fields and upon exit will be written to the ini file

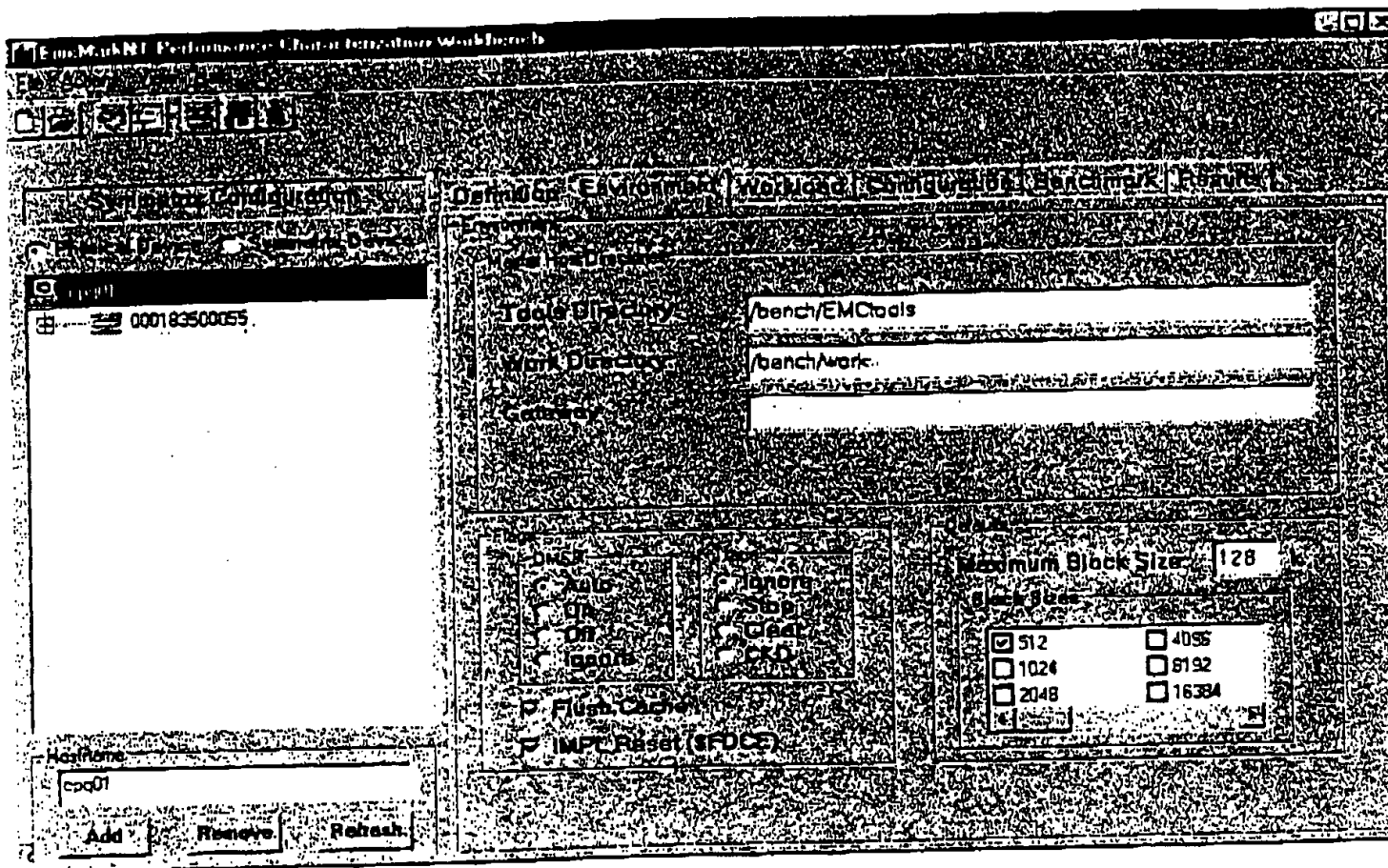


Fig 9E

Tools Directory - where the master scripts are located

Work Directory - your personal work folder

Flags -

DMSP

Trace

Flush Cache -

IMPL Reset (\$FDCE) -

Defaults - Maximum Block size set to 128k

- Default blocks sizes selected for Workload when run directly from the Workbench

- Not saved upon exit, must reset each time

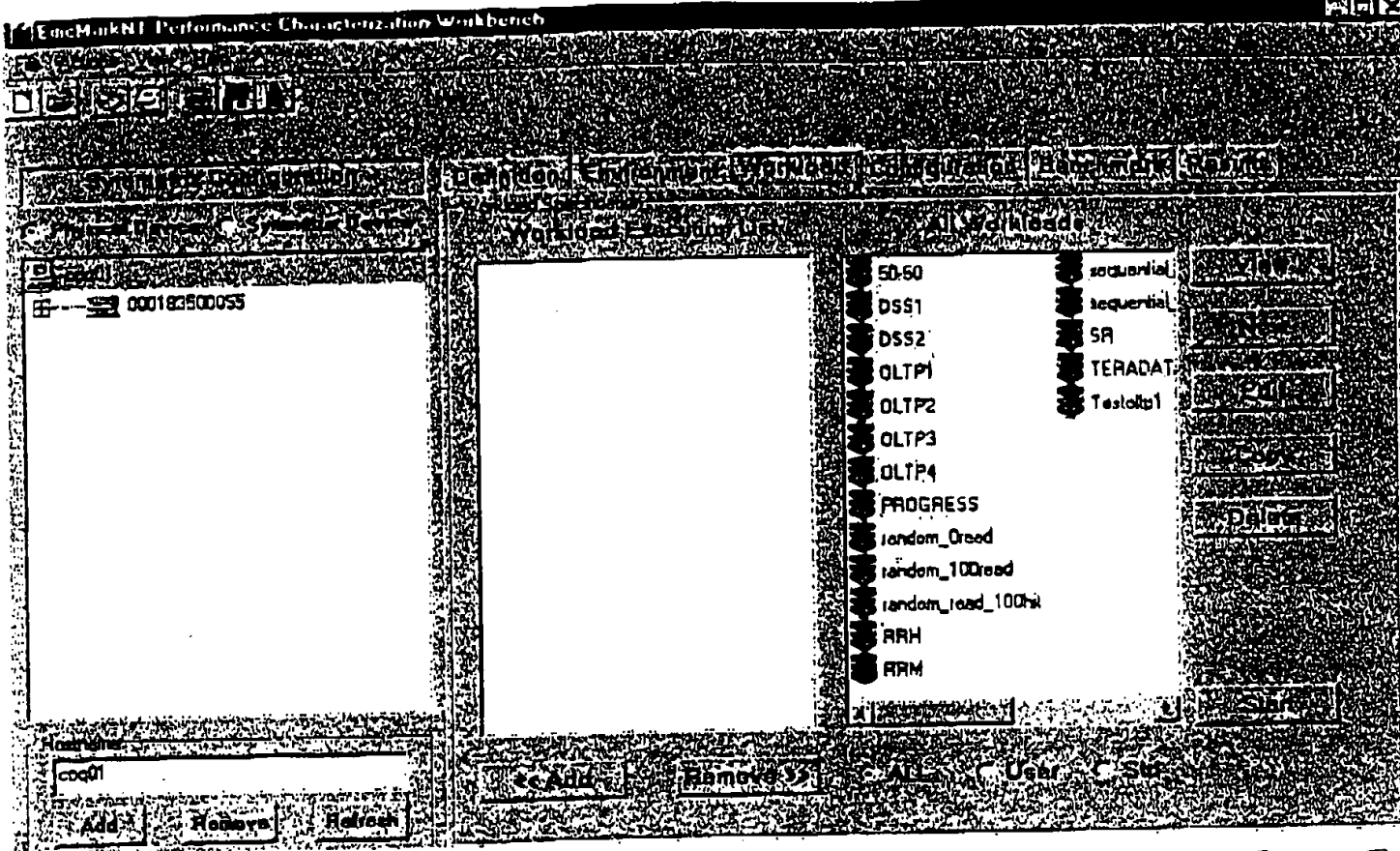


Fig 9F

All - All available Workloads **User** - User Defined Workloads **Std** - Standard Workloads

View - Allows viewing of the detailed definition of a Workloads

New - Brings up the Define Workloads form to define a new Workloads

Edit - Allows editing of User Defined Workloads

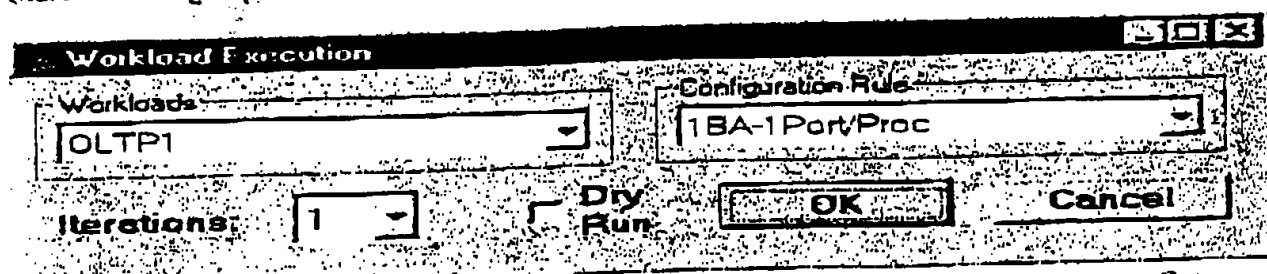
Copy - Copies the selected Workload into a new name, then brings up the Edit screen allowing edits to the new Workload.

Delete - Only for User Defined Workloads. Allows the deletion of a Workload.

Add - Moved the selected Workload over to the Workloads Execution List.

Remove - Removes item from the Workloads Execution List to the All Workloads List

Start - Brings up the Workloads Execution form to define and start the Workloads



Iterations - The number of iterations the Workload should run for

Dry Run - Dry run will run through the scripts but not execute the Workload

OK - Will execute the Workload, bringing up the EmcMark Workload monitor window

Cancel - Will cancel the Workload execution

Fig 9G

Define Workload

Response Time Workload

Edit Workload

Workload Name:

OK Cancel

Workload Transaction Pattern

Seq	% of Workload	% Hit	% Random	% Read	Align	Align Back
0 MB 4 KB 0 B	50	0	100	0	0 MB 5 KB 0 B	0 MB 0 KB
0 MB 4 KB 0 B	30	0	0	100	0 MB 3 KB 0 B	0 MB 0 KB
0 MB 4 KB 0 B	10	0	0	0	0 MB 5 KB 0 B	0 MB 0 KB
0 MB 4 KB 0 B	10	0	0	0	0 MB 3 KB 0 B	0 MB 0 KB

Request Size:
 MBytes KBytes Bytes

Alignment:
 MBytes KBytes Bytes

Back Alignment:
 MBytes KBytes Bytes

Insert Remove

% of Workload:

% Cache Miss/Hit:

% Sequential/Random:

% Write/Read:

- Max Seq cannot be 0
 - Max Seq - max is Max Seq selection
 - Arrow Key - move by 10
 - mouse - move by 100

FIG 9H

Define Workload

Throughput Workload

View Workload

random_100read

OK Cancel

☒ Collect Response Times
☐ Report I/Os as I/Os per Time

Workload Transaction Definition

Size	% of Workload	% Miss	% Random	% Read	% Write	Align Back
0 MB, 0 KB, 0 B	100%	0%	100%	100%	0 MB, 0 KB, 0 B	0 MB, 0 KB

Request Size

MBytes
 KBytes
 Bytes

Alignment

MBytes
 KBytes
 Bytes

Back Alignment

MBytes
 KBytes
 Bytes

Insert Remove

% of Workload

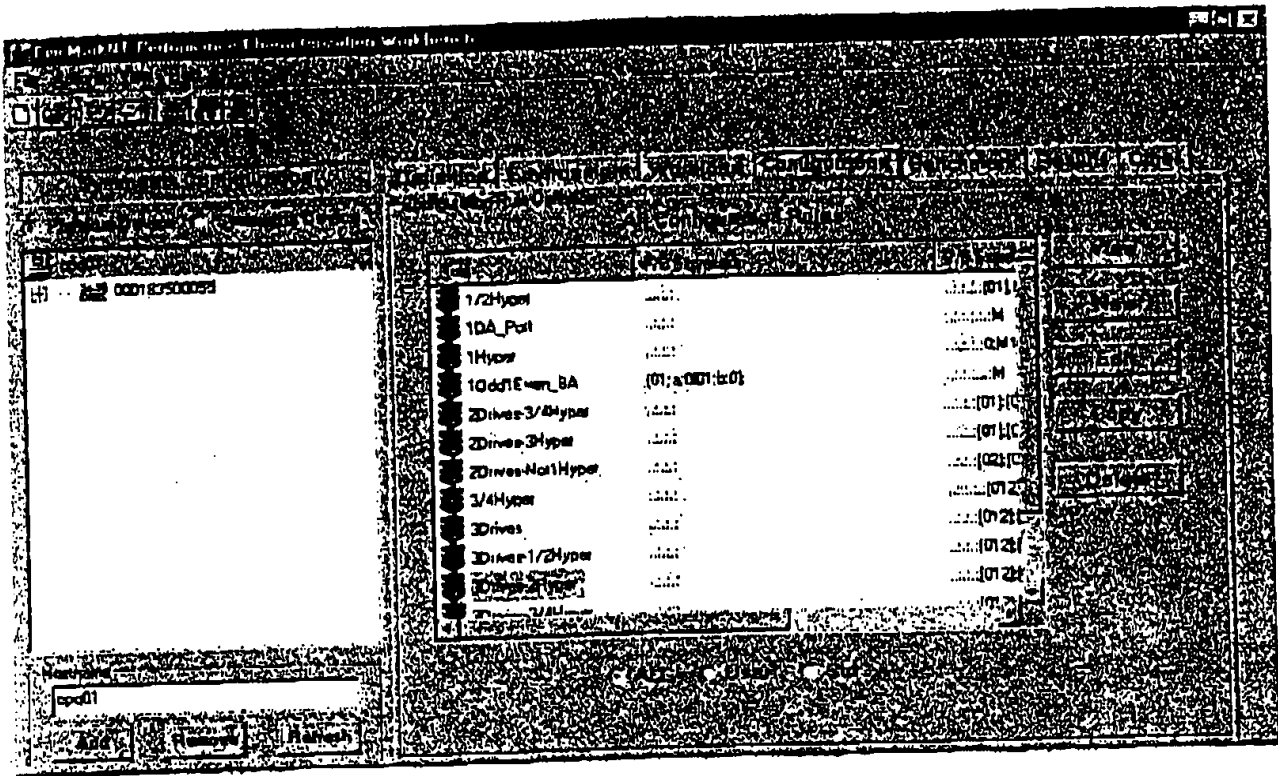
% Cache Misses/Hits

% Sequential/Random

% Write/Read

FIG 9E

Configuration Tab



All - All available Rules User - User Defined Rules Std - Standard Rules

(Fig. 9)

- View - Allows viewing of the detailed definition of Rule
- New - Brings up the Define Workloads form to define a new Rule
- Edit - Allows editing of User Defined Rules
- Copy - Copies the selected Rule into a new name, then brings up the Edit screen allowing edits to the new Rule.
- Delete - Only for User Defined Rules. Allows the deletion of a Rule.

Define Configuration

Front End - BA/Processor/Port information pulled from SymAPI if Symmetrix connected
 Back End - DA/Processor/Port information pulled from SymAPI if Symmetrix connected

Mirros, TIDs and Luns information pulled from SymAPI if Symmetrix connected

All/None buttons toggle checked boxes on or off.

Build Button - will built the expressions if the information has been downloaded from the Symmetrix. If no information is available then the expressions can be manually added to the F/E Expression and B/E Expression boxes.

Update Button - will update the F/E Expression and B/E Expression into the database.

OK will save the rule into the database
 Cancel will terminate the definition

Benchmark Tab

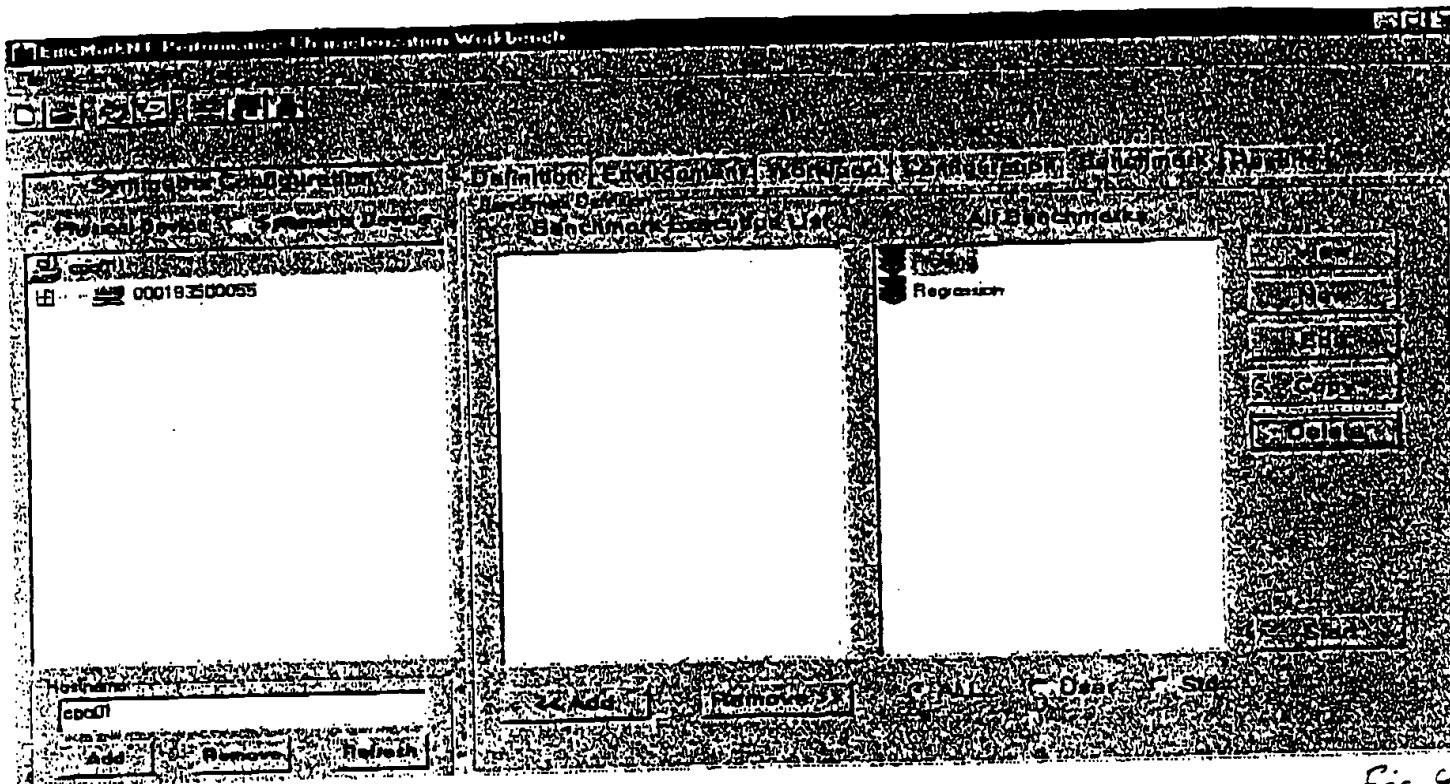


Fig 9

All - All available Benchmarks User - User Defined Benchmarks Std - Standard Benchmarks

- View - Allows viewing of the detailed definition of a benchmark
- New - Brings up the Define Benchmark form to define a new benchmark
- Edit - Allows editing of User Defined Benchmarks
- Copy - Copies the selected benchmark into a new name, then brings up the Edit screen allowing edits to the new benchmark.
- Delete - Only for User Defined Benchmarks. Allows the deletion of a benchmark.
- Add - Moved the selected benchmark over to the Benchmark Execution List. Only one Benchmark can be in the Execution list at a time
- Remove - Removes item from the Benchmark Execution List to the All Benchmarks List
- Start - Brings up the Benchmark Execution form to define and start the benchmark

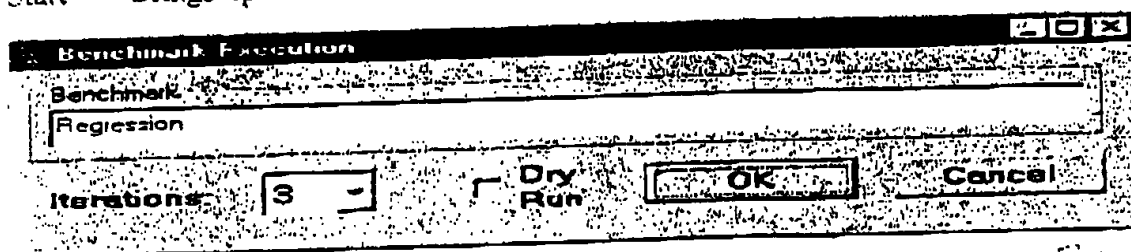


Fig 9.1

- Iterations - The number of iterations the benchmark should run for
- Dry Run - Dry run will run through the scripts but not execute the benchmark
- OK - Will execute the benchmark, bringing up the EmcMark Benchmark monitor window
- Cancel - Will cancel the benchmark execution

Define Benchmark

View Benchmark

Regression

Benchmark Workload Definition

Workload	Configuration Rule	Queue Size	Cache Size	Memory
RRM	1Hyper	-1	-1	
RRM	Everything	-1	-1	
OLTP1	Everything	-1	-1	
OLTP2	3Hypers/4Drives	-1	-1	
OLTP3	1Hyper/2Drives	-1	-1	
DSS1	1Hyper	-1	-1	
DSS2	Everything	-1	-1	
TERADATA	2Drives/DA-3Hyper/4Drives	-1	-1	

Max Test Period: 0 Min Test Period: 0 Begin: 0 End: 0

Multiplier: 0 LSeeks: 0 Start Byte: 0 End: 0

Workload: RRM Configuration Rule: 1Hyper Insert Remove

00642267, 001300

Fig 9A

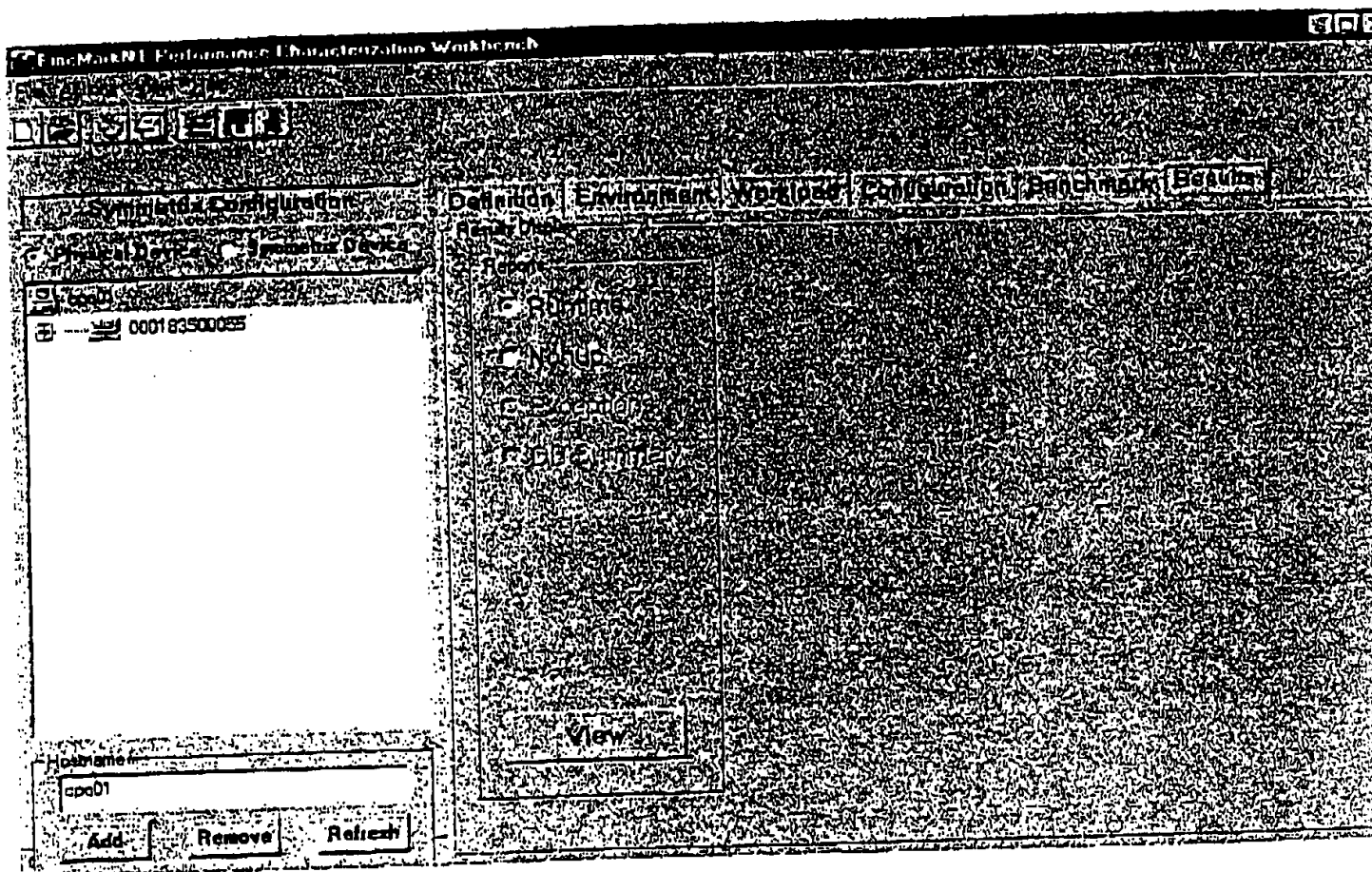


Fig 90

00842267.081800

SECRET - DO NOT REPRODUCE

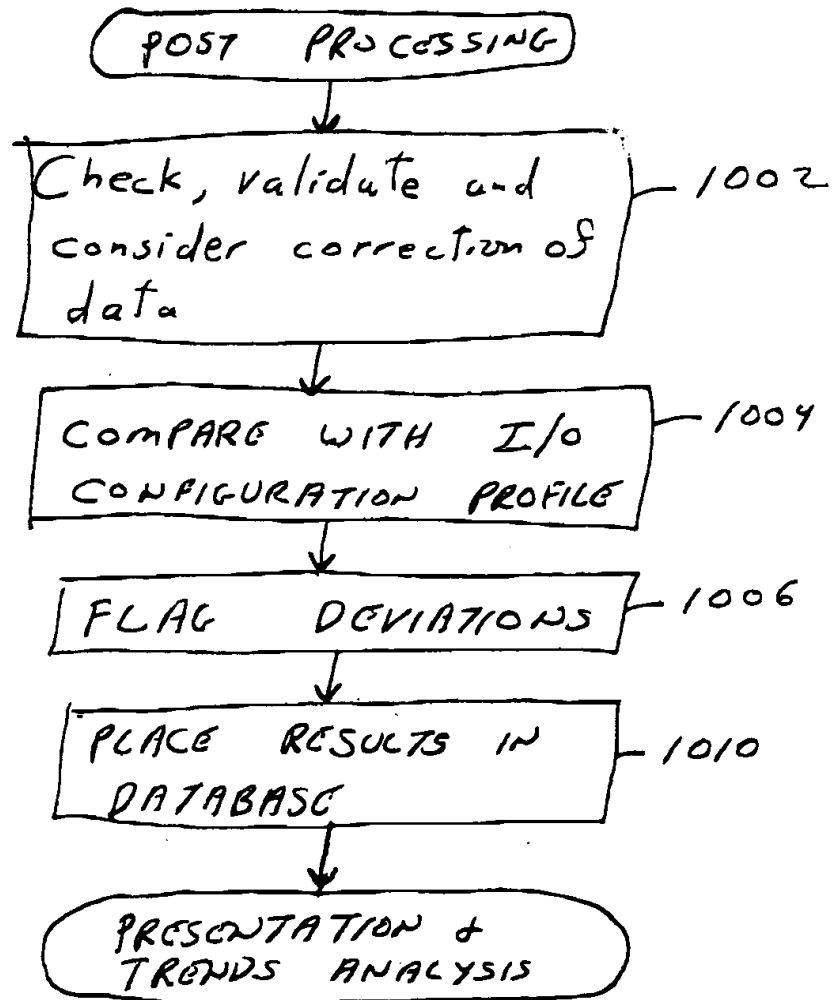


FIG. 10

Process Advanced Characterization Raw Data File

This function is used when your data format is not standard and you need to sort your data in the correct format for Splus to read the file.

Table Variables		Summary Functions	
Row	config	IO Function	max
Column	req.size	MB Function	max
Configuration	test.type		
Test Description	none		

OK Cancel

Fig. 10 A

1. Select CTRL A
2. The Advanced Characterization Window will appear
3. Select the correct row/column/configuration/test description options for your data
4. Select the summary functions for your data
5. Select OK
6. A Characterization file will be generated in the Post Processing Folder with the extension _adv.txt

Process Advanced DB Simulator Raw Data File

Table Variables		Summary Functions	
Row	test.type	IO Function	max
Configuration	config	MB Function	min
Column	interval		

OK Cancel

Fig. 10 B

1. Select CTRL B
2. The Advanced DB Simulator Window will appear
3. Select the correct row/column/configuration/test description options for your data
4. Select the summary functions for your data
5. Select OK
6. A DB Simulator file will be generated in the Post Processing Folder with the extension _adv.txt

File Descriptions

File Name	Description	HighLights
Char.Summary	Summary file of each Characterization test broken down by iteration, test type, and configuration	
Char.Splus	Data file feed to Splus to create Characterization Objects	
Char.Errors	Characterization errors produced from processing the raw data files.	Message appears if error file exists.
SX.Summary	SX summary data broken down by iteration, test type and configuration.	
SX.Splus	Data file feed to Splus. Used with Char.Summary file to create Characterization Objects	
SX.Errors	SX errors from processing the raw data files	Message appears if error file exists.
DB.Table	Summary file of each DB Simulator test broken down by iteration, test type and configuration	
DB.Splus	Data file feed to Splus to create DBSimulator Objects	
DB.Errors	DB Simulator errors produced from processing the raw data files	Message appears if error file exists.
SX_DB.Summary	SX DB summary data broken down by iteration, test type and configuration.	
SX_DB.Splus	Data file feed to Splus. Used with DB.Splus file to create DBSimulator Objects	
SX_DB.Errors	SX_DB errors produced from processing the raw data files	Message appears if error file exists.
Cache Ratio Report	Report tracking the Cache ratio from the Sym and the processed data	Report name: "CacheRatioReport.txt" Located in the Raw Data folder Message appears if a report

October 13, 1999

21 of 32

EMC² Confidential

Fig. 11

0087807224960

EmWorkNT Data Reduction Workbench

File Edit Project Log View Help

Project | Test Phase | Data Transfer | Process Raw Data | Post Processing | Reporting | Database | Charts

MSDatab

Database: F:\TestArea\Regression.5266.Overnight\Database\symm48.5265 Select DB

Test Type: Random Delayed Fast Write

☒ symm48.5265.libre

☒ Freeze 5265 34.02 MLog

☒ Decode 38.00000

☐ Decode 37.00000

Characterization

Rept Size: 512 LDR: 1

Flippers: 1 Drives: 2

BAC: 1 DAs: 2

BA Ports: 1 DA Ports: 2

BA Ports: 1 DA Ports: 2

Type: Online Chart

By Test Type

View All

Percent Scale: 2 6 9 15

Value Scale: 4 8 12 16

Load DB Defaults

Chart

F:\TestArea\symm48.5265.libre\code.38.freeze 2/2/00 4:08 PM

Fig. 12